Physician Education: Expansion of the Radiation Protection Practice

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Abstract. Over the past several years, physician knowledge of radiation risk and risk associated with medical exams involving radiation has been studied and found deficient. In some cases, radiation risk was overestimated leading to patient anxiety. In other cases, the risk was underestimated leading to cavalier ordering of medical radiation exams. Even physicians practicing in radiology were unable to accurately assess the risk for their patients. Many of the studies concluded that more effort is needed to educate the physician community on radiation risk. Objectives of the Health Physics Society, a not-for-profit society of radiation safety professionals, include dissemination of radiation safety information and public education. In 1996, the Society launched a Web site as one method to achieve its objectives (www.hps.org). On the Web site, the initial focus was to provide radiation information resources for the public, but more recently that was expanded to include specific resources for teachers, students, legislators and regulators, and first responders. In addition to these, the Society is adding educational resources for physicians. Published studies we reviewed suggest that physician education should include information about radiation risk, radiation effects, the amount of radiation dose from medical exams, and potential doses to the conceptus when a mother undergoes medical exams involving radiation. The information we provide includes these topics as well as radiation basics (radiation units, radiation terms, radiation in the environment) separated into brief educational programs (slide shows). To complement these, topical information sheets are available. Also available is a tool allowing physicians to ask individual questions of our experts about radiation, radiation exposure, and radiation risk. This approach of providing information and resources to physicians not only provides a benefit to the physician personally, but especially to his or her patients.

1. Introduction

Studies have shown that physicians’ understanding and comprehension of radiation exposures and risks associated with those exposures are deficient [1-12]. In some cases, radiation risk was overestimated leading to patient anxiety. In other cases, the risk was underestimated leading to cavalier ordering of medical radiation exams. In many cases, even board-certified radiologists were unable to accurately assess the risk to their patients. Many of the studies concluded that more effort is needed to educate the physician community on radiation exposures and radiation risk.

Other questions that arose from these studies included “Who should be overseeing this education?” “How do we bring the education to the physicians?” and “What topics within the broad category of radiation physics are of pertinent interest?”

Objectives of the Health Physics Society, a not-for-profit society of radiation safety professionals, include dissemination of radiation safety information and public education. With these objectives in mind, Society leadership believed it could and should play a large role in physician education - not the only role,
but a critical one. This position answered part of the “who” question—the Health Physics Society would embark on a project to provide physician-based radiation education within the boundaries of the Society’s overall objectives.

Medical schools, like many academic institutions, increasingly face declining grant monies and loss of revenue [13-15]. This leads to increased pressures on faculty and students to focus on specific topics that a majority of students will need and use in the clinical environment rather than having a class or classes on a topic that few will use or many will infrequently use [13, 14, 16]. The challenge for medical education is to identify what information physicians need to know for everyday practice and what information is better accessed with tools of some nature, e.g. books, publications [16]. An unintended result of these influences is little or no coursework in the radiation sciences. This, despite the fact that many of these students will become physicians using radiation-producing devices in their practice, ordering radiation imaging tests, or getting questions from their patients about the safety of radiation.

Part of this then leads to the medical education directive to enhance individualized learning (rather than standardized lectures or a “one size fits all” curriculum design). As a result, computer networks are increasingly becoming a central component of the learning and teaching environment in medical schools. In 2004-2005, computer-based methods were used substantially in medical schools for a variety of tasks (for example, 90% of schools used the Internet to distribute course objectives or syllabi and 96% used the Internet to deliver lecture notes) [13-15].

2. Methods

2.1 Educational Format

With many medical schools using computer-based tools for their curricula as well as continuing education, it seemed reasonable that the same approach could be used for continuing education on radiation biology and radiation exposures in medicine. According to studies of medically-related online learning, there are several key factors to consider when designing materials for this environment, three of which are: user requirements, available support by the developing organization, and adaptability to varying contexts [13, 17].

User requirements are two-fold for this application: 1) having a need for information, and 2) quick access to the information. Learner needs were defined based on questions previously received from the physician community, results of studies showing gaps in what is and should be known, and on the fact that the materials need to be focused and quickly assimilated.

The Health Physics Society offers organizational support for development of more topics, correspondence for questions or comments, and the creation of various types of the same documents to make them easier to use. Ward, et al., [16] showed that support of the materials in the form of individual correspondence by specialists in the area enhances learning. The creation of various types of the same documents lends itself to the adaptability of the materials by creating them in Adobe® format, PowerPoint® format, and Word® format where applicable. Different designs lend themselves to being reviewed in many formats and being uploaded onto other devices for later viewing or showing.

2.1.1 Health Physics Society

The Health Physics Society promotes preparation and dissemination of public information, education and training opportunities, and scientific information exchange. In 1996, the Society launched a Web site as one method to achieve these objectives (www.hps.org).
The initial focus of the Web site was to provide a directory of members for use by Society membership and to provide radiation information resources for the public. More recently the Web site was expanded to include specific resources for teachers, students, legislators and regulators, and first responders.

Recently, several authors have advocated for additional physician radiation-topic training [1, 6, 7, 10-12]. Most state that physicians lack knowledge of radiation doses patients receive from medical imaging. Others suggest that physicians also lack knowledge of radiation risk, benefit, and protection [3, 5, 8, 9]. Groves, et al. [4], and Ratnaplan, et al. [2], focused on lack of physician knowledge of fetal doses when or if an exam is done during pregnancy.

Interestingly, there are two divergent points of view in these published papers. One suggests that the lack of knowledge may cause more imaging tests to be ordered when another, non-radiation test could be performed or even when a different lower dose imaging test could be done [1, 3-5, 7, 10, 12]. The other, specifically relating to fetal doses, suggests that the lack of knowledge may lead to pregnant women not receiving the medical care they expeditiously need [2]. These published studies did not acknowledge that a number of physicians recommended termination of pregnancy following any medical imaging exam that their pregnant patient may have received, a practice that may result from a lack of radiation science education and is borne out of our experience through our Ask the Experts program (outlined in more detail in Section 2.1.2).

Since Health Physics Society membership includes specialized expertise in radiation biology, benefit, risk, and protection, Society leadership decided to create a source of information specifically for physicians and to add a special link on the Web site for that information. The Society’s goals do not include providing guidance on utilization of particular exams and, as such, no attempt was made to include that type of information on the Web site.

With these objectives in mind, health physicist members developed the online information and radiologist members reviewed the content. Initial topics included radiation and pregnancy, medical radiation exposures, radiation benefits and risks, and radiation health effects. Since brevity was a priority, Web pages initially had a three-page limit and slide programs had a 12-slide limit. Additional ideas for topics that arose while creating these programs were not added to the program, per se, but were put on a list of future topics.

2.1.2 Ask the Experts

Another section on the Health Physics Society Web site titled “Ask the Experts” provides answers to questions from the general public and radiation protection professionals. Since its inception in 2003, over 7,000 questions related to radiation issues have been received from around the world [18]. Each question is reviewed and answered individually. The person submitting a question selects an appropriate category (radiation basics, radiation and pregnancy, alpha emitters, etc.), enters his/her question, and submits it. The person receives a thank you for submitting the question, and the question is forwarded to one of 19 Topic Editors. The Editor-in-Chief of the Web site also receives a copy of the question to assist in filtering out homework, non-radiation questions, and other miscellaneous items that are not related to health physics.

The Topic Editor decides whether to answer the question directly or refer it to one of the “experts.” Either way, the person asking the question receives an individual response to the question. Questions are typically answered within one week of receipt, although an attempt is made to answer within two days or less for pregnancy-related questions.

In addition to the individual answer, the Topic Editor will also decide if the question or answer is unique and, if so, will have it posted publicly on the site for others to read.
3. Discussion

The advantages of online continuing education for physicians include just-in-time availability, efficiency, and access anywhere [13, 16, 19], and it may be cost-effective [13, 15, 16]. Sanders, et al. [17], point out that this method offers physicians, who work in rural America with little routine contact with colleagues and possibly fewer dollars for travel, a feeling of connectedness and keeps them up-to-date.

One physician’s working group provided immediate feedback on the brevity issue — it was appreciated that the topical papers and slide programs were brief, to the point, and easily understood. This process, called “chunking,” has been shown to improve comprehension of the material and longer learner retention [13, 20].

Current formats allow materials to be adapted to enhance the learners’ experience, which leads to greater comprehension and usability [13, 16], and to tailor the materials to meet the objectives of the Society. According to Ruiz, et al. [13], the idea of a learning object (a group of materials, specifically structured for an educational purpose), although relatively new outside cognitive theory circles, has been shown to be very effective. In that manner, focusing of topics to fit Society objectives and meet physicians’ needs deliberately become learning objectives.

4. Future

The information currently available on the Web site is in a structured format. While this approach has been well liked by medical audiences, some individuals also like a less formal environment [17, 20]. For this reason, the Web site editors are determining whether the creation of a Blog on this site would be of interest. The Blog would contain a brief synopsis of an article in recent radiological literature (Radiology, American Journal of Roentgenology, etc.) and allow readers to offer additional comments.

The editors are also considering addition of case studies to the Web site and, most importantly, to the Ask the Expert Physician-to-Physician functionality. This later piece would allow physicians to submit questions on related radiation topics, which would be answered individually by a physicist and radiologist. This may be very beneficial to the non-radiation sciences physicians who rarely deal with these topics and to their patients who will learn more about their exam, and the doses, benefits, and risks. Again, advice would not be provided on appropriate utilization of exams, nor would we provide information related to diagnosis.

In a British Journal of Medicine commentary, Dr. Divaker stated that a physician’s professional practice should lend itself to treating each patient as an individual – not as a one size fits all. He goes on further to say that is the ability to provide this kind of care requires a mix of appropriate education and experience [21]. The materials made available on the Society Web site are based on sound science and allow for immediate knowledge to assist the physician in the best treatment of their patient. Accomplishing this endeavor would further serve to meet the Society’s educational objectives and assist in filling the gap in physician radiation safety education that has been shown in recent studies.
References